CLAIMS:

1. An ionization device for ionization of particles in the form of a flow in a direction of propagation of said particles comprising:

a sealed vacuum chamber in which said ionization device is located;

at least one hollow cylindrical body having a central longitudinal axis and a longitudinal slit having a length, said flow of said particles coinciding with said central longitudinal axis;

a source of electrons located outside said at least one hollow cylindrical body to form an electron beam directed onto said flow of particles through said longitudinal slit in the direction perpendicular to said direction of propagation;

means for application of a positive voltage to said at least one hollow cylindrical body to form an anode slit for said electron beam; and

a zone of ionization of said particles that has a length and is arranged on said longitudinal axis.

2. The ionization device of Claim 1, further comprising means for adjusting said length of said zone of ionization from the lengths of said slit to a part of the length of said slit.

3. The ionization device of Claim 2, wherein said source of electrons comprises an electron gun having an outer electrode with means for application of an alternating potential with an adjustable amplitude to said outer electrode; said means for adjusting said length of said zone of ionization comprises: said electron gun; an elongated conductive body aligned with said longitudinal slit and inclined with respect to said longitudinal axis; and a source of heating said elongated conductive body.

4. The ionization device of Claim 1, wherein said at least one hollow cylindrical body has end faces, said ionization device further comprising means for retaining said electrons in said ionization device against leakage outside said ionization device through at least one of said end faces, said means for retaining said electrons being located outside at least one of said end faces and in a close proximity thereto.

5. The ionization device of Claim 4, wherein said means for retaining said electrons in said ionization device comprises at least one conductive body which is connected to a source of a negative potential.

6. The ionization device of Claim 2, wherein said at least one hollow cylindrical body has end faces, said ionization device further comprising means for retaining said electrons in said ionization device against leakage outside said ionization device through at least one of said end faces, said means for retaining said electrons being located outside at least one of said end faces and in a close proximity thereto.

7. The ionization device of Claim 6, wherein said means for retaining said electrons in said ionization device comprises at least one conductive body which is connected to a source of a negative potential.

8. The ionization device of Claim 3, wherein said at least one hollow cylindrical body has end faces, said ionization device further comprising means for retaining said electrons in said ionization device against leakage outside said ionization device through at least one of said end faces, said means for retaining said electrons being located outside at least one of said end faces and in a close proximity thereto.

9. The ionization device of Claim 8, wherein said means for retaining said electrons in said ionization device comprises at least one conductive body which is connected to a source of a negative potential.

10. An ionization device for ionization of particles in the form of a flow in a direction of propagation of said particles comprising:

a sealed vacuum chamber in which said ionization device is located;

at least three concentric hollow cylindrical bodies comprising an inner hollow cylindrical body, an intermediate hollow cylindrical body, and an external hollow cylindrical body;

at least one longitudinal slit in each of said three concentric cylindrical bodies, said at least one longitudinal slit of each of said three hollow cylindrical bodies being aligned with the positions of said at least one longitudinal slit in other of said three concentric hollow cylindrical bodies of said plurality;

means for application of positive potentials to each of said hollow cylindrical bodies with gradual decrease in the value of said positive potentials in the direction from said external cylindrical body towards said inner cylindrical body;

a source of electrons located outside of said external cylindrical body in alignment with said at least one longitudinal slit for forming an electron beam directed onto said flow of particles through said at least one longitudinal slit in the direction perpendicular to said direction of propagation; and

a zone of ionization of said particles that has a length and is arranged on said longitudinal axis.

11. The ionization device of Claim 10, further comprising means for adjusting said length of said zone of ionization from the lengths of said at least one slit to a part of the length of said at least one slit.

12. The ionization device of Claim 11, wherein said source of electrons comprises an electron gun having an outer electrode with means for application of an alternating potential with an adjustable amplitude to said outer electrode; said means for adjusting said length of said zone of ionization comprises: said electron gun; an elongated conductive body aligned with said longitudinal slit and inclined with respect to said longitudinal axis; and a source of heating said elongated conductive body.

13. The ionization device of Claim 1, wherein said at least three hollow cylindrical bodies have end faces, said ionization device further comprising means for retaining said electrons in said ionization device against leakage outside said ionization device through at least one of said end faces, said means for retaining said electrons being located outside at least one of said end faces and in a close proximity thereto.

14. The ionization device of Claim 13, wherein said means for retaining said electrons in said ionization device comprises at least one conductive body which is connected to a source of a negative potential.

15. The ionization device of Claim 10, wherein said vacuum chamber is provided with an inlet port for admission of said flow of particles to said ionization device; said ionization device further comprising particle guiding means directing said flow of particles to said ionization device along said direction of propagation; said particle guiding means being located inside said vacuum chamber and in front of one of said end faces which is nearest to said particle guiding means; said particle guiding means comprising a mechanism with a plurality of replaceable orifices that can be aligned with said direction of propagation and replaced without interrupting operation of said ionization device.

16. The ionization device of Claim 12, wherein said vacuum chamber is provided with an inlet port for admission of said flow of particles to said ionization device; said ionization device further comprising particle guiding means directing said flow of particles to said ionization device along said direction of propagation; said particle guiding means being located inside said vacuum chamber and in front of one of said end faces which is nearest to said particle guiding means; said particle guiding means comprising a mechanism with a plurality of replaceable orifices that can be aligned with said direction of propagation and replaced without interrupting operation of said ionization device.

17. The ionization device of Claim 14, wherein said vacuum chamber is provided with an inlet port for admission of said flow of particles to said ionization device; said ionization device further comprising particle guiding means directing said flow of particles to said ionization device along said direction of propagation; said particle guiding means being located inside said vacuum chamber and in front of one of said end faces which is nearest to said particle guiding means; said particle guiding means comprising a mechanism with a plurality of replaceable orifices that can be aligned with said direction of propagation and replaced without interrupting operation of said ionization device.

18. The ionization device of Claim 10, further comprising: means for periodic variation of said positive potential on said intermediate cylindrical body with an adjustable frequency.

19. The ionization device of Claim 12, further comprising: means for periodic variation of said positive potential on said intermediate cylindrical body with an adjustable frequency.

20. The ionization device of Claim 14, further comprising: means for periodic variation of said positive potential on said intermediate cylindrical body with an adjustable frequency.

21. The ionization device of Claim 10, further comprising means for periodic variation of said positive potential on said inner cylindrical body with an adjustable frequency.

22. The ionization device of Claim 12, further comprising means for periodic variation of said positive potential on said inner cylindrical body with an adjustable frequency.

23. The ionization device of Claim 14, further comprising means for periodic variation of said positive potential on said inner cylindrical body with an adjustable frequency.

24. The ionization device of Claim 20, further comprising means for periodic variation of said positive potential on said inner cylindrical body with an adjustable frequency.

25. The ionization device of Claim 21, further comprising means for periodic variation of said positive potential on said inner cylindrical body with an adjustable frequency.

26. A method for ionization of particles in the form of a flow in a direction of propagation of said particles, said particles having different velocities, composition, and masses, said method comprising the steps of:

providing an ionization device for ionization of said flow of particles by means of a beam of electrons directed onto said flow of particles, said electrons having energy, said flow of particles having a longitudinal axis that coincides with said direction of propagation, said beam having a focus on said longitudinal axis, said ionization device having a length in said direction of propagation, and a zone of ionization which has a length and is located on said longitudinal axis; and

providing a single-event ionization substantially of each of said particles by adjusting said length of said zone of ionization from said lengths of said ionization device to a part of said length of said ionization depending on said velocities, compositions, natures, and masses of said particles.

27. The method of Claim 26, further comprising the steps of:

providing said ionization device with a mechanism having a plurality of replaceable orifices used for admitting said flow of said particles into said ionization device by passing said particles through one of said orifices;

aligning said one of said orifices with said direction of propagation; and

replacing said one of said orifices with another orifice when said one of said orifices is clogged.

28. The method of Claim 26, further comprising the step of periodically varying position of said focus with an adjustable frequency.

29. The method of Claim 27, further comprising the step of periodically varying position of said focus with an adjustable frequency.

30. The method of Claim 26, further comprising the step of periodically varying said energy of said electrons.

31. The method of Claim 27, further comprising the step of periodically varying said energy of said electrons.

32. The method of Claim 28, further comprising the step of periodically varying said energy of said electrons.

33. The method of Claim 30, further comprising the step of periodically varying said energy of said electrons.